

## SECTION C Descriptions and Specifications

350 HP Electric AC Induction Motor  
Statement of Work

The 350 HP electric AC Induction Motor to be furnished shall be in accordance with Military Specification MIL-M-17060E(SH) dated 20 May 1977 and Amendment 1 dated 15 May 1981.

Paragraphs (a) – (x) refer to section 6.1.1 of MIL-M-17060E. Paragraphs (y) – (gg) are additional specifications required for motor procurement by Amendment 1.

- (a) Motors, 60 Hertz, Alternating Current, Integral-Horsepower, Shipboard Use; MIL-M-17060E; 20 May 1977 including Amendment 1, Dated 15 May 1981 and the following:
- (b) Service A – Service A for Surface Ships, Centrifugal Pump Applications
- (c) Ambient Temperature – 50<sup>0</sup>C
- (d) Voltage – 440V, 3 Phase, 60 Hz
- (e) Duty - Continuous
- (f) Enclosure – TEFC with labyrinth type non-rubbing seals both ends
- (g) HP – 350 Continuous with locked rotor current not to exceed 2400 amps and full load current not to exceed 390 amperes.
- (h) RPM – 1800 (synchronous) constant speed
- (i) Type – Squirrel cage induction with not less than 87% power factor full load
- (j) Design – B with not less than 70% pull up rotor torque for centrifugal applications
- (k) Slip – Not to exceed 1.00 percent maximum at full rated load and temperature rise
- (l) Mounting – Foot mounted horizontal
- (m) Ball bearing, noise tested in accordance with MIL-B-17931 with grease slingers on shaft. Bearing used on each end shall be of different size not to exceed 314 nor less than size 311 with laminated phenolic ball retainer and preload spring inboard of free bearing. Bearing temperature rise outer ring of bearing not to exceed 40<sup>0</sup>C.

- (n) The conduit openings shall be sized to suit two FSGU-150 cables which are shielded and insulated. The conduit must accommodate a ground connection directly to the motor frame and it must accommodate a direct connection between the cable shield and conduit box.
- (o) Insulation Class F – The stator windings shall be insulated and varnish treated to provide a “sealing insulation system”. The sealed insulation system shall be accomplished by a manufacturer who shall be certified as required by MIL-M17060E. The motor manufacturer shall submit a copy of his letter of certification with his offer. The sealed insulation system shall be in accordance with the requirements of MIL-M-17060E, Paragraph 4.3.4.20 and IAW MIL-M-17080F Para 3.5.1.33. A copy of the test results on each stator shall be submitted to NAVSEA Philadelphia attn: Code 9344.

Random Wound Sealed Insulation System. Each random wound sealed insulation system motor shall have a stainless nameplate attached near the regular nameplate stating “Stator winding insulated to provide a sealed insulation system. Caution: If rewinding is required do not use burnout oven for stripping. Cut off one end turn, heat winding by radiant heat and pull winding from slot.”

This motor will be operated using a variable speed drive. The potential exists for traveling waves on the output power cables of the drive to develop motor voltages up to 3 times the rated voltage. The rise time of the traveling waves can reach up to 4000V/us. The motor must have the proper insulation system which will classify it as “VFD Comptatible” and shall be duly noted in the engineering drawings.

- (p) N/A
- (q) Balance – precision with facilities for fine balancing
- (r) N/A
- (s) Nonmagnetic motors not required
- (t) Not for submarine surface
- (u) Structureborne noise to be type 2 with levels not to exceed 5db above that shown for 100Hz to 160Hz on Figure 1 dated 21 June 1965 in MIL-STD-740 dated 13 Jan 1965.
- (v) N/A
- (w) Shock Test – MIL-S-901, Grade A, Type A
- (x) Packaging – Level A, Preservation – Level A, Markings – As specified
- (y) Frame 509 with dimensions and tolerances as specified in NEMA MG 1 Para 4 with shaft extension dimensions as follows: from centerline of mounting hole in foot nearest to end shaft (drive end) 13.25 inches (BA+N-W). Shaft diameter 2.375 inches +0.000/-0.001(U).

Shaft length 4.5 inches(V). Shaft height from bottom of foot to centerline of shaft, 12.5  
+.00/-.06 inches.

- (z) Weight – 4250 pounds
- (aa) Motor thermal growth “D” dimension from bottom of foot to centerline of shaft not to exceed 0.005 inches with temperature change from ambient to full load heat equilibrium.
- (bb) Efficiency – Minimum 97 percent at 4/4 load, 96 percent at 3/4 and 95 percent at 2/4 load test efficiency of each motor shall be shown on the nameplate.
- (cc) Winding temperature rise – not to exceed 70<sup>0</sup>C with minimum 7 hours at full 350HP load in 50<sup>0</sup> C ambient. To be verified by test.
- (dd) The motor shall be provided with thermal protection for stator and bearings, with motor control including a plug-in relay with minimum one pair of normally open and one pair of normally closed contacts mounted on motor. The motor system monitor shall be a series 145 as manufactured for military service by Power Control corporation, Pittsburgh, PA or equivalent NAVSEA approved motor thermal protection system.  
The temperature sensing system shall include a minimum of five thermal sensors, one in contact with each bearing outer ring and three in the stator winding. Any deviation must be approved by procuring agency. Positive temperature coefficient (PTC) thermal sensors shall be used and have a temperature coefficient of resistance at a 130<sup>0</sup> C switchpoint of not less than 15 percent per degree centigrade. High potential test shall be performed on the installed sensors between shorted sensors leads and the motor windings. The test voltage shall be twice the nominal system voltage plus 1000 volts.
- (ee) Air gap – 0.05 inches minimum
- (ff) Motor efficiency shall be determined by IEEE standard tests. IEEE Std 112, Method “B” for Dynamometer and /or method “C” for duplicate machines with loss segregation identification as required in method “E” and using linear regression analyses. Test record shall include both data with identification of stray losses in watts and shall be shown on the motor master drawing. Efficiency shall be shown on the motor nameplate.
- (gg) Airborne noise levels in accordance with table below in db re 20uPA sound pressure

Octave Band Center Frequency - Hz								
31.5	63	125	250	500	1K	2K	4K	8K
66	66	66	73	73	87	87	80	57